IMPACT BIOENERGY

Distributed Bioenergy Solutions

A Model Called Community Supported Biocycling

February 18, 2016

County of Los Angeles Department of Public Works

Alternative Technology Advisory Subcommittee

Summary

- Problem & Vision
- Community Scale Concept
- Benefits
- Economics

The Problem

- **Wasted Resource:** We pay to waste 40% of our food while 1 in 5 families lack a secure supply of food.
- **Landfilling:** 1.6MM tons of food waste is trucked to landfills each year in the Puget Sound region at a cost of $218 million
- **Traffic:** 180 trucks per day to export waste from the region
- **Energy:** 80%+ grid energy is “lost in translation”
- **Jobs:** 4,370 jobs are being exported – that could be created with a distributed bioenergy economy
- **Soil:** 23 different pesticides have been measured in Puget Sound from petrochemical run-off

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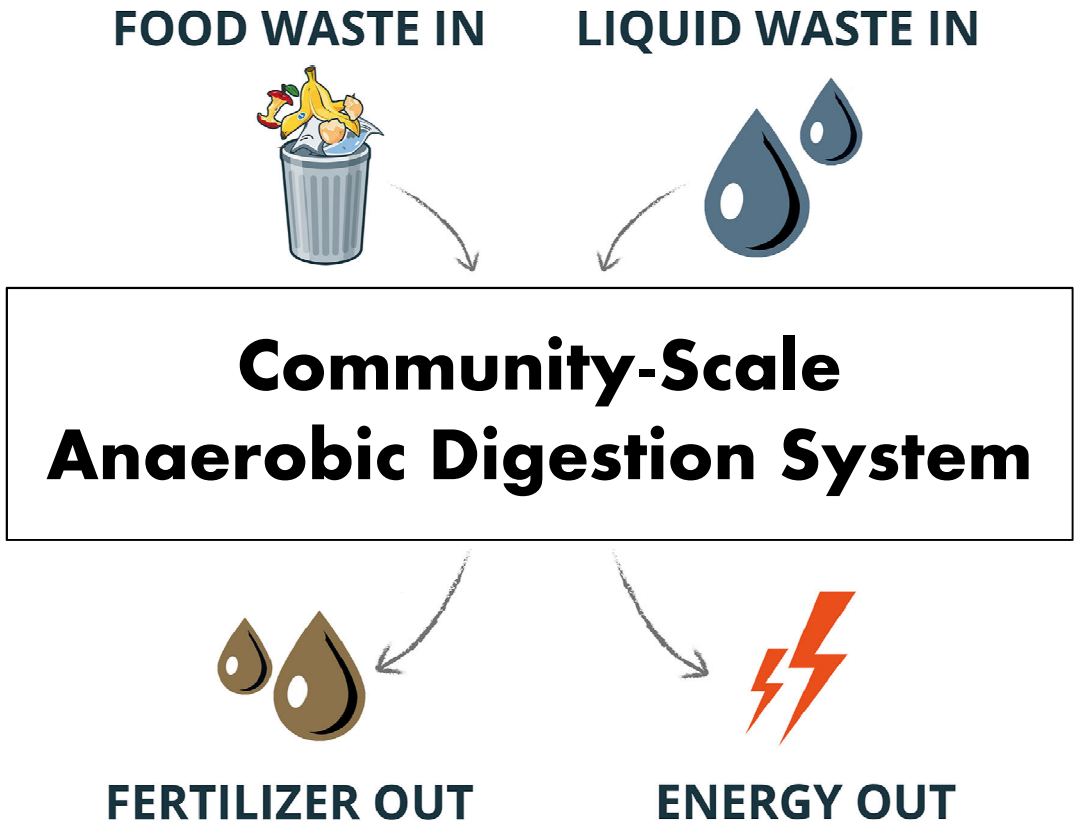
Vision: Food Waste to Energy + Fertilizer Resource



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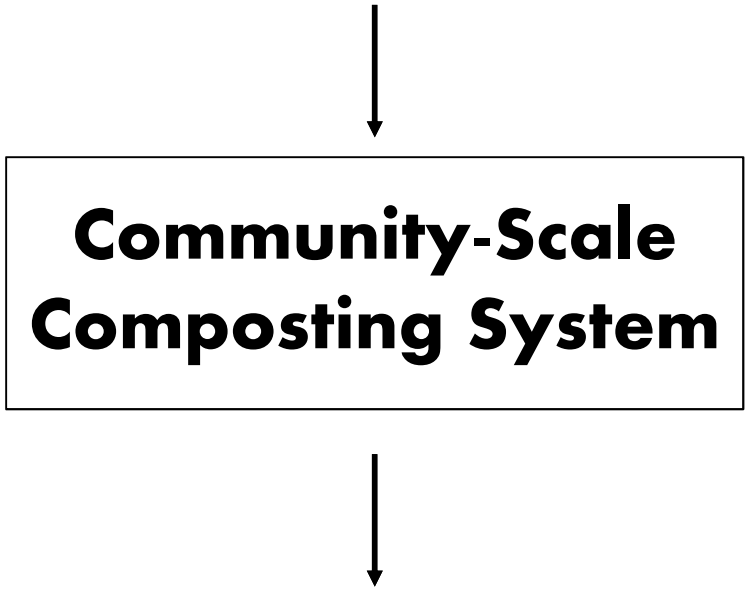
Vision: Landscape, Wood, OCC to Soil Resource

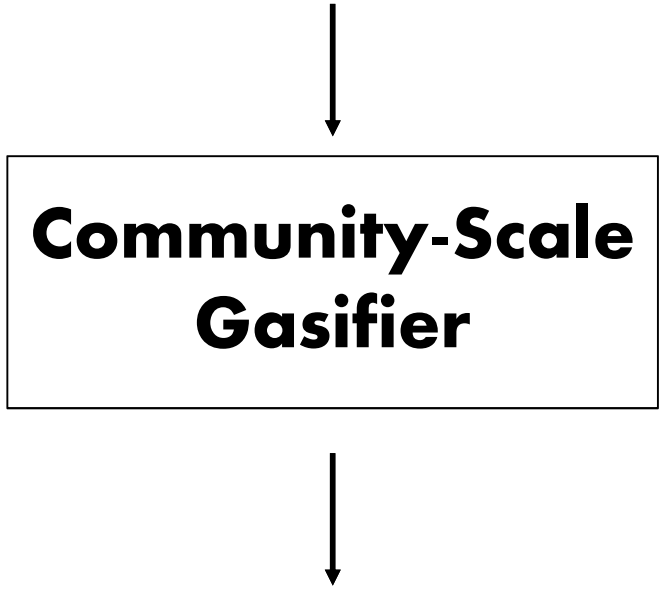
YARD WASTE + WOOD + OCC + DIGESTATE IN



COMPOST + MULCH + MANUFACTURED SOIL OUT

Vision: Brush, Wood, OCC to Biocarbon Resource

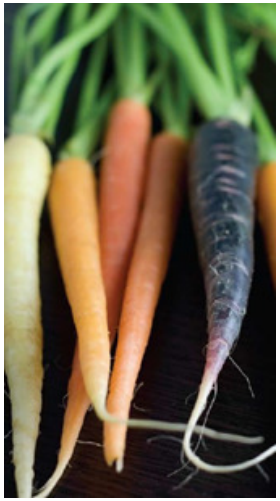
DRIED BRUSH + WOOD + OCC IN



H2 SYNGAS + HEAT + BIOCHAR OUT

Vision: Hyperlocal (< 2 mile radius)

- Hauling waste and recyclable organics is costly in dollars, fuel use, and carbon footprint. There are onsite solutions for
  - food waste, foodservice paper, landscape waste, and wood waste
- Capturing the embodied energy and carbon is possible with distributed bioenergy solutions for converting organic materials into
  - renewable energy, fertilizer, compost, soil products, and biocarbon
- Additional benefits include the capacity to
  - Build jobs and sustainability
  - Retain dollars locally
  - Support local food hubs and CSAs



Community Supported Biocycling

- Links communities, innovators, thought leaders on the ground
  - Working reference facilities for credibility and technology growth
  - Networking projects, facilities, and educational centers
  - Practicing the ethic of Biocycle Magazine, Renewable Energy, USCC, and Community Supported Agriculture

- Establish service-based solutions
  - Local food system improvement
  - Local ecosystem improvement
  - Furthering education and job creation
  - Decreased resource consumption

www.impactbioenergy.com/csb

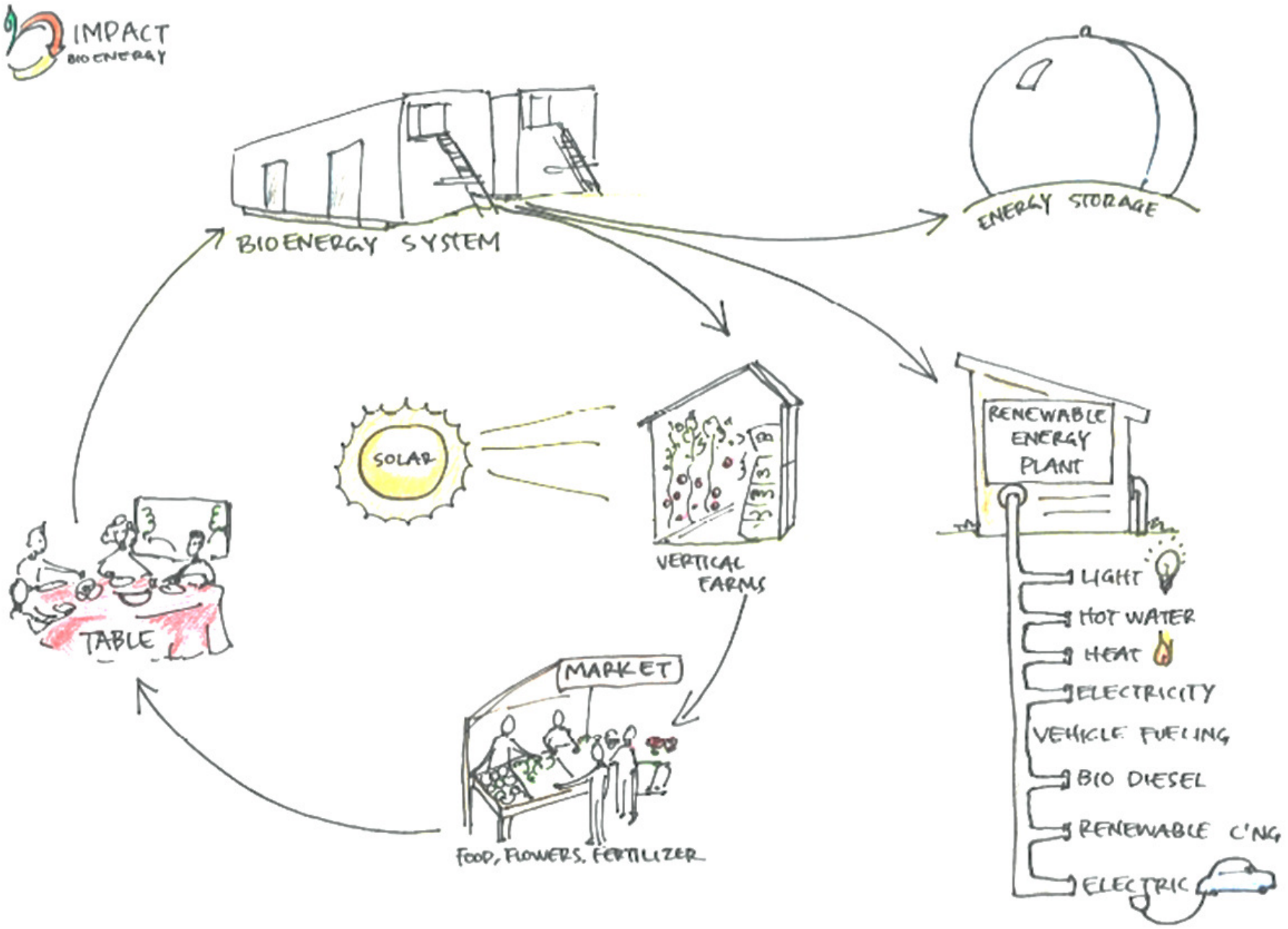
Impact Opportunity

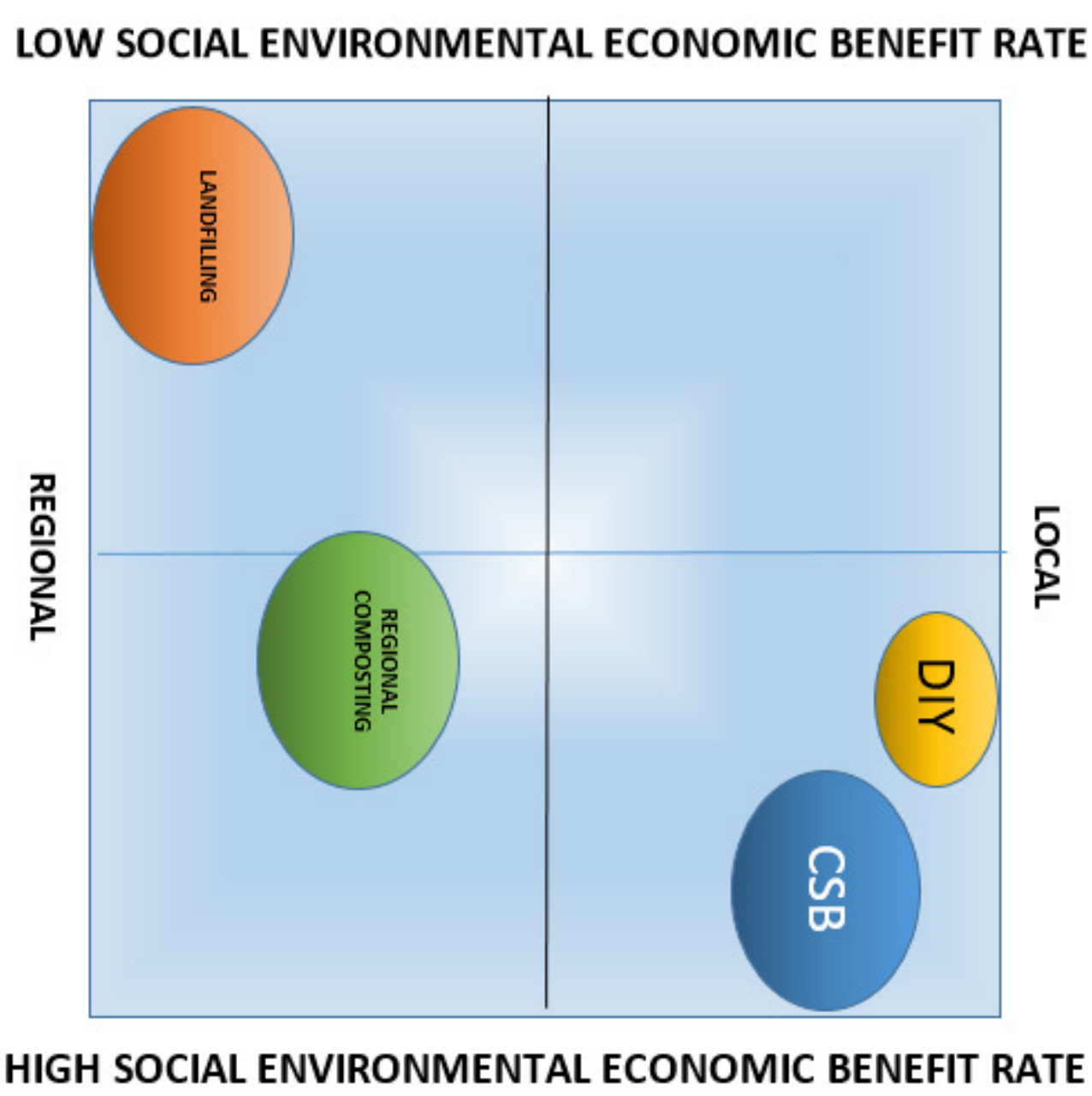
- A new forms of renewable energy
  - Independence from of fossil fuels
  - Complimentary to onsite solar and wind renewables
  - Creates heat, light, electricity, or vehicle fuel

- Organic matter & non-petroleum fertilizer
  - Probiotics for Soil & Plants™
  - Improves fertility naturally
  - Substitute for pesticides, herbicides, fungicides and other synthetics

- Local agriculture
  - Farm-to-Fork-to-Farm

- New jobs and local commerce
  - Strengthen local communities


IMPACT
BIO ENERGY
BIOENERGY SYSTEM
ENERGY STORAGE
SOLAR
VERTICAL FARMS
RENEWABLE ENERGY PLANT
LIGHT
HOT WATER
HEAT
ELECTRICITY
VEHICLE FUELING
BIO DIESEL
RENEWABLE C'NG
ELECTRIC
TABLE
MARKET
FOOD, FLOWERS, FERTILIZER


LOW SOCIAL ENVIRONMENTAL ECONOMIC BENEFIT RATE
LANDFILLING
REGIONAL
REGIONAL COMPOSTING
LOCAL
DIY
CSB
HIGH SOCIAL ENVIRONMENTAL ECONOMIC BENEFIT RATE

Scaling Anaerobic Digestion

- Customizable and scalable for each application
- Pre-fabricated and quick project development
- Modular and expandable
- No site work or site infrastructure needed
- Built with domestic components in North America
- Completely portable at 25 to 925 tons per year (135 – 5,000 lbs. per day)

Scaling Composting

- Go to the Exhibit Hall and see them!
- Numerous choices under 1,000 tons per year (5,500 lbs. per day)
  - Batch systems – ASP outdoor, semi-enclosed, enclosed
  - Agitated bays
  - Rotating drums
  - DIY systems

Scaling Gasification

- Wood 3/8” to 4” particles @ 15% M
- 900 tons per year input (470 lbs./hr)
- Electric and propane assist
- 1.8 MMBTU per hour heat output
- 19 lbs. per hour biochar output

53 lbs. per hour input

470 lbs. per hour input

Performance – 2015 AD Rollout

- Digester performance met expectations
- Engine generator met expectations
- Gas storage and safety systems met expectations
- Improvements in place
  - Feedstock preparation
  - Full enclosure
  - Seasonal storage

Economics – AD Only

Capital Investment	quantity	units	unit cost	amount
Anaerobic Biomethane System with 4 kW gen	1	LS	$ 58,600	$ 58,600
Anaerobic Expansion system with 12 kW gen	1	LS	$ 49,600	$ 49,600
Gas Storage Expansion 100 m3	1	LS	$ 32,000	$ 32,000
Digestate storage tank for forklift, 330 gal	5	LS	$ 300	$ 1,500
telescopic handler	-	LS	$ 60,000	$ -
shredding system 50 hp electric/75 hp diesel	-	LS	$ 75,000	$ -
composting system for HORSE	-	LS	$ 75,000	$ -
subtotal capital cost				$ 141,700
offsetting grant, crowdfunding, private party participation			25%	$ 35,425
adjusted gross CAPEX				**$ 106,275**

Economics – AD Only

Income and Avoided Costs

avoided tip fees paid to AD	175	tons	$	278.76	$	48,784
tip fees for Composting	-	tons	$	278.76	$	-
carbon credits - avoided greenhouse gases	63	tonnes	$	53.47	$	3,371
value of fertilizer	37,770	gallons	$	0.75	$	28,327
value of heat	2,139	therms	$	1.00	$	2,139
value of electricity	62,622	kwhr	$	0.090	$	5,636
subtotal; value or revenue					**$**	**89,716**

Expenses

labor	780	hours	$	22.00	$	17,160
transport of foodwaste (bike)	140	tons	$	144.00	$	20,160
transport of digestate (pickup truck)	30,216	gallons	$	0.08	$	2,417
power	13,200	kwhr	$	0.090	$	1,188
consumables and repairs	175	tons	$	10.00	$	1,750
subtotal expenses					**$**	**42,675**

Project Financial Metrics

Annual Project Savings (Cost)	**34%**				**$**	**36,000**
IRR (Internal Rate of Return over 10 years	**32%**					
Simple payback period in years	**3.0**					

Economics – AD + Composting

Capital Investment	quantity	units	unit cost	amount
Anaerobic Biomethane System with 4 kW gen	1	LS	$ 58,600	$ 112,000
Anaerobic Expansion system with 12 kW gen	1	LS	$ 49,600	$ 49,600
Gas Storage Expansion 100 m3	1	LS	$ 32,000	$ 32,000
Digestate storage tank for forklift, 330 gal	5	LS	$ 300	$ 1,500
telescopic handler	1	LS	$ 60,000	$ 60,000
shredding system 50 hp electric/75 hp diesel	-	LS	$ 75,000	$ -
composting system for HORSE	1	LS	$ 75,000	$ 75,000
subtotal capital cost				$ 330,100
offsetting grant, crowdfunding, private party participation			25%	$ 82,525
adjusted gross CAPEX				**$ 247,575**

Economics – AD + Composting

Income and Avoided Costs

avoided tip fees paid to AD	175	tons	$	278.76	$	48,784
tip fees for Composting	100	tons	$	278.76	$	27,876
carbon credits - avoided greenhouse gases	65	tonnes	$	53.47	$	3,486
value of fertilizer	37,770	gallons	$	0.75	$	28,327
value of compost and soil products	95	CY	$	30.00	$	2,850
value of heat	2,139	therms	$	1.00	$	2,139
value of electricity	62,622	kwhr	$	0.090	$	5,636
subtotal; value or revenue					**$**	**120,558**

Expenses

labor	1,300	hours	$	22.00	$	28,600
transport of foodwaste (bike)	140	tons	$	144.00	$	20,160
transport of digestate (pickup truck)	30,216	gallons	$	0.08	$	2,417
power	15,327	kwhr	$	0.090	$	1,379
consumables and repairs	275	tons	$	10.00	$	2,750
contract grinding	100	tons	$	75.00	$	7,500
contract screening	50	tons	$	60.00	$	3,000
subtotal expenses					**$**	**65,807**

Project Financial Metrics

Annual Project Savings (Cost)	**12%**				**$**	**30,000**
IRR (Internal Rate of Return over 10 years	**4%**					
Simple payback period in years	**8.3**					

Crowdfunding Experience

- The project was designed to fund a specific Seattle project and to measure interest
  - 16,000 video views in 30 days
  - 68 countries read it
  - U.S., Canadian, and global backers
- The project reached its goal through 334 ‘backers’ in 30 days
- Crowdfunding is not easy but it works

Thank You

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CSB Website

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